UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,700,240 B2
DATED : March 2, 2004
INVENTOR(S) : Naotaka Akiwa

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 13,
Line 11, replace claim 1 with the following:

1. A stepping motor comprising:

a permanent magnet type rotor with a plurality of poles secured to a rotating shaft and a stator having stator magnetic poles with stator magnetic pole teeth in which excitation windings are wound on a plurality of magnetic poles in a star or delta connection,

wherein the rotor is magnetized in different directions alternately circumferentially and a relationship between a predetermined number of the stator magnetic poles and a predetermined number of the rotor magnet poles is established in accordance to a following equation: M = 4F / 3 where M is the number of poles of the rotor and F is the number of the stator magnetic poles,

the rotor is cylindrical in shape with the stator disposed inside, disposed opposing the surfaces of the stator magnetic pole teeth through an air gap which is of a uniform dimension throughout the circumference between the surfaces of the stator magnetic pole teeth of the stator and the rotor, and

wherein the relationship of the predetermined numbers of stator poles and rotor poles enables surface magnetic flux distribution thereof having a substantially sinusoidal wave form circumferentially.

Line 46, replace claim 4 with the following:

4. A stepping motor according to any one of claim 1, wherein an arc-shaped deformation preventing groove is provided along the circumference at the side end of a bearing holder contacting the base to which the stepping motor is mounted.

Line 65, replace claim 7 with the following:

7. A stepping motor according to claim 5, further comprising a rotary polygon mirror secured to the rotating shaft which is rotatably provided through the cylindrical bearing holder vertically mounted on the base to which the stepping motor is mounted, said polygon mirror rotates along with the rotating shaft and wherein the rotary polygon mirror is provided on the outer periphery of the rotor yoke with each mirror surface corresponding to a magnetic pole of the rotor of the stepping motor.

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Column 14,
Line 7, replace claim 8 with the following:

8. A stepping motor device comprising:

a stepping motor including

a permanent magnet type rotor with a plurality of poles secured to a rotating shaft,

a stator having stator magnetic poles with stator magnetic pole teeth in which excitation windings are wound on a plurality of magnetic poles in a star or delta connection, and

a rotary polygon mirror provided on the outer periphery of a rotor yoke rotatable along with the rotating shaft with each mirror surface corresponding to a magnetic pole of the rotor,

wherein the rotor is magnetized in different directions alternately circumferentially and a relationship between a predetermined number of the stator magnetic poles and a predetermined number of the rotor magnet poles is established in accordance to a following equation: M = 4F / 3 where M is the number of poles of the rotor and F is the number of the stator magnetic poles,

the rotor is cylindrical in shape with the stator disposed inside, disposed opposing the surfaces of the stator magnetic pole teeth through an air gap which is of a uniform dimension throughout the circumference between the surfaces of the stator magnetic pole teeth of the stator and the rotor, and

wherein said relationship of the predetermined numbers of stator poles and rotor poles enables surface magnetic flux distribution thereof having a substantially sinusoidal wave form circumferentially;

a leakage flux detector for detecting changes in magnetic poles provided on a cylindrical end surface of the rotor of the stepping motor;

a driving means to control rotation of the stepping motor by impressing a driving signal in a three-phase single-two-phase excitation mode to three excitation feeding terminals in a star or delta connection wound on a plurality of magnetic poles of the stepping motor; and

a means to detect the position of the rotary polygon mirror by a signal from the leakage flux detector.

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Column 14 (cont'd),
Line 44, replace claim 9 with the following:

9. A stepping motor device comprising:

a stepping motor including a permanent magnet type rotor with a plurality of poles secured to a rotating shaft, and

a stator having stator magnetic poles with stator magnetic pole teeth in which excitation windings are wound around a plurality of magnetic poles in a star or delta connection,

wherein the rotor is magnetized in different directions alternately circumferentially and a relationship between a predetermined number of the stator magnetic poles and a predetermined number of the rotor magnet poles is established in accordance to a following equation: M = 4F / 3 where M is the number of poles of the rotor and F is the number of the stator magnetic poles,

the rotor is cylindrical in shape with the stator disposed inside, disposed opposing the surfaces of the stator magnetic pole teeth through an air gap which is of a uniform dimension throughout the circumference between the surfaces of the stator magnetic pole teeth of the stator and the rotor, and

wherein said relationship of the predetermined numbers of stator poles and rotor poles enables surface magnetic flux distribution thereof having a substantially sinusoidal wave form circumferentially;

a driving means to impress a driving signal in a three-phase single-two-phase excitation mode to three excitation feeding terminals and to control rotation of the stepping motor by a signal from a leakage flux detector for detecting magnetic flux leaking from a notch provided in a rotor yoke; and

a means to repeat the processing to control the rotation a predetermined number of times and to issue a warning when normal rotation is not obtained.

Column 15,
Line 7, replace claim 10 with the following:

10. A stepping motor according to any one of claim 2, wherein an arc-shaped deformation preventing groove is provided along the circumference at the side end of the bearing holder contacting the base to which the stepping motor is mounted.

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INVENTOR(S) : Naotaka Akiwa

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Column 15 (cont'd),
Line 11, replace claim 11 with the following:

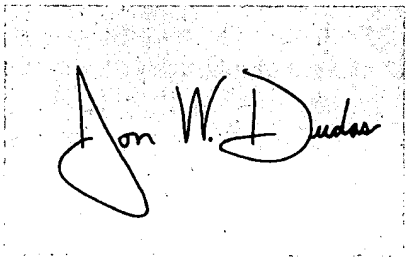
11. A stepping motor according to any one of claim 3, wherein the arc-shaped deformation preventing groove is provided along the circumference at the side end of the bearing holder contacting the base to which the stepping motor is mounted.

Column 16,
Line 7, replace claim 19 with the following:

19. A stepping motor according to claim 6, further comprising a rotary polygon mirror secured to the rotating shaft which is rotatably provided through the cylindrical bearing holder vertically mounted on the base to which the stepping motor is mounted, said polygon mirror rotates along with the rotating shaft and wherein the rotary polygon mirror is provided on the outer periphery of the rotor yoke with each mirror surface corresponding to a magnetic pole of the rotor of the stepping motor.

Signed and Sealed this

Sixth Day of December, 2005



JON W. DUDAS
Director of the United States Patent and Trademark Office